4329.2778
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Finnegan, Henderson, Farabow
Garrett & Dunner, L.L.P.
1300 I Street, N.W.
Washington, DC 20005-3315

FINNEGAN, HENDERSON,
FARABOW, GARRETT & DUNNER, L.L.P.

Date Mailed: 04/19/2002

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Applicant(s)

Norimasa Nakamura, Iruma-shi, JAPAN;
Toru Hanada, Ome-shi, JAPAN;
Takeshi Tajima, Hamura-shi, JAPAN;

Assignment For Published Patent Application

KABUSHIKI KAISHA TOSHIBA;

Domestic Priority data as claimed by applicant

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Title

Information device with wireless modules

APR 23 2002

DCD 4-23-02

Preliminary Class
370

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Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

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TITLE OF THE INVENTION

INFORMATION DEVICE WITH WIRELESS MODULES

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is based upon and claims the benefit of priority from the prior Japanese Patent Application No. 2001-275497, filed September 11, 2001, the entire contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an information device having two or more wireless modules and, more particularly, to use control of these wireless modules.

2. Description of the Related Art

Personal computers having a plurality of wireless devices have recently been developed along with the development of the wireless communication technology. An example of the personal computer has a Bluetooth module using a 2.4-GHz ISM (Industrial Scientific Medical) band and a wireless LAN module based on IEEE 802.11b.

This personal computer can perform wireless communication using the Bluetooth module and wireless communication using the wireless LAN module.

If, however, a plurality of wireless functions simultaneously operate, they interfere with each other to decrease the communication speed because they use

the same 2.4-GHz ISM band.

In this case, the user may select a wireless device at the application level. Merely selecting a wireless device at the application level cannot prevent simultaneous use of a plurality of wireless device by user operation. A personal computer which incorporates two wireless devices in a single housing cannot meet the wireless standards of some areas that inhibit a plurality of wireless devices from simultaneously operating. It is difficult for the user to determine the radio frequency band used in a wireless module incorporated in an information device. Further, the user must have advanced knowledge to switch and use a plurality of wireless modules.

BRIEF SUMMARY OF THE INVENTION

The present invention has been made in consideration of the above situation, and has as its object to provide an information device which disenables unselected wireless devices by directly controlling hardware, and thus can prevent a plurality of wireless modules from simultaneously operating.

It is another object of the present invention to provide an information device which enables one wireless device, disenables another wireless device, and thus can meet the wireless standards of some areas that inhibit a plurality of wireless devices from simultaneously operating in a personal computer which

incorporates two wireless devices in a single housing.

To achieve the above objects, according to a first aspect of the invention, there is provided an information device comprising a first wireless module which performs wireless communication in accordance with a first communication way, a second wireless module which performs wireless communication in accordance with a second communication way, means which can select either one of the first and second wireless modules, and a control unit which, when the first wireless module is selected by the selection means, disenables wireless communication via the second wireless module and then enables the first wireless module, and when the second wireless module is selected, disenables wireless communication via the first wireless module and then enables the second wireless module.

According to a second aspect of the invention, there is provided an information device comprising a Bluetooth wireless module which performs wireless communication in accordance with a Bluetooth standard, a wireless LAN unit which performs wireless communication in accordance with an IEEE 802.1b standard, a first utility which determines a selected wireless module on the basis of a user instruction, and when the selected wireless module is determined as the Bluetooth wireless module, instructs to power off the

wireless LAN unit, a second utility which instructs to turn on the Bluetooth wireless module on the basis of the instruction from the first utility that represents power off of the wireless LAN unit, a BIOS which instructs to power off the wireless LAN unit on the basis of the instruction from the first utility, and instructs to power on the Bluetooth wireless module on the basis of the instruction from the second utility, and a controller which controls to stop power supply to the wireless LAN unit on the basis of the instruction from the BIOS that represents power off of the wireless LAN unit, and which, upon receiving the instruction from the BIOS that represents power on of the Bluetooth wireless module, controls to supply power to the Bluetooth wireless module after the wireless LAN unit is powered off.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

FIG. 1 is a block diagram showing the hardware arrangement of a notebook type personal computer according to an embodiment of the present invention;

FIG. 2 is a block diagram showing the relationship between an OS, a BIOS, and an EC;

FIG. 3 is a block diagram showing the relationship between the OS, the BIOS, and the EC;

FIG. 4 is a flow chart for explaining the operation of the notebook type personal computer according to the embodiment of the present invention;

FIG. 5 is a flow chart for explaining the operation of the notebook type personal computer according to the embodiment of the present invention; and

FIG. 6 is a flow chart for explaining the operation of the notebook type personal computer according to the embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

A notebook type personal computer according to an embodiment of the present invention will be described below with reference to the several views of the accompanying drawing.

FIG. 1 is a block diagram showing the hardware arrangement of the notebook type personal computer according to the embodiment of the present invention.

In FIG. 1, a BIOS 1 executes the basic control of the personal computer and serves as an interface with an application program. The BIOS 1 is connected to an EC (Embedded Controller) 3 via an I2C bus 2, and issues a command to the EC 3 to control it.

The EC 3 is a one-chip microcomputer which interprets a command issued from the BIOS 1 and controls power supply and control signals to various devices within the personal computer.

More specifically, the EC 3 controls a power controller 4 to control power supply to a Bluetooth module 5.

The EC 3 controls the Bluetooth module 5 to electrically connect/disconnect a USB bus 8 between the Bluetooth module 5 and a USB controller 6. The EC 3 outputs a control signal to control a power controller 11 of a wireless LAN module 9 and control power supply to an RF controller 12. The control signal output from the EC 3 to the power controller 11 undergoes logical operation with a signal output from a digital controller 10, and the logical operation result serves as a control signal to the power controller 11.

The power controller 4 supplies a power of 3.3 V to the Bluetooth module 5 on the basis of a control signal from the EC 3.

The Bluetooth module 5 communicates with the USB controller 6 via the USB bus 8, and uses an antenna 7 to perform wireless communication based on the Bluetooth standard. The Bluetooth module 5 has a function of stopping Bluetooth operation and radiation of wireless radio waves when it is electrically disconnected from the USB controller 6.

The USB controller 6 is connected to the Bluetooth module 5 via the USB bus 8, and controls the Bluetooth module 5.

The wireless LAN module 9 is connected to the EC 3, executes wireless communication based on IEEE 802.11b, and comprises the digital controller 10, power controller 11, and RF controller 12. The wireless LAN

module 9 communicates with the system via a PCI bus 14.

The digital controller 10 is connected to the PCI bus 14, and controls the digital part of the wireless LAN module 9 and the RF controller 12. The digital controller 10 outputs a control signal to the power controller 11.

The power controller 11 controls supply of a 3.3-V power to the RF controller 12 on the basis of control signals from the digital controller 10 and EC 3.

The RF controller 12 controls the wireless part of the wireless LAN module 9, and performs wireless communication using an antenna 13 on the basis of the IEEE 802.1b standard.

A bridge 15 is connected to the PCI bus 14, to a CPU 16 via a CPU bus 19, and to a memory 17 via a memory bus 18. The bridge 15 executes bus bridge control.

The CPU 16 controls the entire system. As shown in FIG. 2, the memory 17 stores a Bluetooth control driver 31-1, Bluetooth power control utility 31-2, and wireless device switching utility 31-3 included in an OS used in the personal computer of this embodiment.

The EC 3 is connected to a keyboard 21 serving as a user interface via a keyboard controller 20.

The Bluetooth control driver 31-1 controls the Bluetooth module 5.

The Bluetooth power control utility 31-2 controls

power supply to the Bluetooth module 5.

The wireless device switching utility 31-3 is a program for selecting a wireless device by using a prescribed key combination such as a hot key.

The operation of the notebook type personal computer according to the embodiment will be described with reference to the block diagrams of FIGS. 2 and 3 showing the relationship between the OS, the BIOS, and the EC, and the flow charts of FIGS. 4 to 6.

If a hot key which realizes a specific function is input by a predetermined key combination through the keyboard 21 and the BIOS detects the hot key (YES in S0), the wireless device switching utility 31-3 is activated (S1). The wireless device switching utility 31-3 checks whether Bluetooth is selected (S2).

If YES in S2, the wireless device switching utility 31-3 instructs the BIOS 1 to power off the wireless LAN (S3: see FIG. 3).

Having received the instruction from the wireless device switching utility 31-3, the BIOS 1 instructs the EC 3 to power off the wireless LAN (S4: see FIG. 3).

Having received the instruction from the BIOS 1, the EC 3 controls to stop power supply to the RF controller 12 via the power controller 11 (S5). Then, radiation of radio waves from the wireless LAN module 9 stops.

The wireless device switching utility 31-3

notifies the Bluetooth power control utility 31-2 that Bluetooth has been selected (S6: see FIG. 2). Having received the notification from the wireless device switching utility 31-3, the Bluetooth power control utility 31-2 instructs the BIOS 1 to power on the Bluetooth module 5 (S7: see FIG. 2).

The BIOS 1 instructs the EC 3 to power on the Bluetooth module 5 (S8: see FIG. 2). Then, the EC 3 controls the power controller 4 so as to supply power to the Bluetooth module 5 (S9).

After the Bluetooth module 5 is powered on, the USB controller 6 detects the Bluetooth module 5, and the OS 31 detects that the wireless LAN module 9 has been connected to the system (S10).

The Bluetooth control driver 31-1 is loaded to the OS 31 (S11), and the flow shifts to processing in S0.

If NO in S2, the wireless device switching utility 31-3 notifies the Bluetooth power control utility 31-2 that the wireless LAN has been selected (S13: see FIG. 2).

The Bluetooth power control utility 31-2 instructs the Bluetooth control driver 31-1 to perform use stop processing (S14: see FIG. 2).

Based on a response from the Bluetooth control driver 31-1, the Bluetooth power control utility 31-2 instructs the BIOS 1 to power off the Bluetooth module 5 (S15).

The BIOS 1 instructs the EC 3 to power off the Bluetooth module 5 (S16). When the EC 3 is instructed by the BIOS 1 to power off the wireless LAN module 9, it controls the Bluetooth module 5 so as to electrically disconnect the Bluetooth module 5 and USB controller 6 (S17).

After the Bluetooth module 5 is electrically disconnected from the USB controller 6, the EC 3 controls the power controller 4 so as to stop power supply to the Bluetooth module 5 (S18).

After power supply to the Bluetooth module 5 stops, the OS 31 detects that the Bluetooth module 5 has been disconnected from the system, and unloads the Bluetooth control driver 31-1 (S19). Then, radiation of radio waves from the Bluetooth module 5 via the antenna 7 stops.

After the wireless LAN module is powered off and radiation of radio waves from the wireless LAN module is completely inhibited, the wireless device switching utility 31-3 instructs the BIOS 1 to power on the wireless LAN (S20). Upon being instructed by the wireless device switching utility 31-3 to power on the wireless LAN, the BIOS 1 instructs the EC 3 to power on the wireless LAN module 9 (S21).

The EC 3 controls the power controller 11 to supply power to the RF controller 12 (S22). Then, the wireless LAN module 9 radiates radio waves via the

antenna 13.

The notebook type personal computer according to the embodiment can activate a wireless device switching utility by using a hot key which realizes a specific function with a key combination instructed by the user in advance, and can easily select a wireless device to be used. The interference between wireless devices using the same frequency can be prevented.

A notebook type personal computer which incorporates a plurality of wireless devices in a single housing can meet the wireless standards of some areas that inhibit a plurality of wireless devices from simultaneously operating.

Although the embodiment has exemplified IEEE 802.11b and Bluetooth, the present invention can also be applied to another wireless communication standard of emitting radio waves, such as IEEE 802.11a or HomeRF.

The present invention is not limited to the above embodiment, and can be variously modified without departing from the spirit and scope of the present invention in practical use.

As has been described above, the present invention can provide an information device which enables one wireless device, disenables another wireless device, and thus can meet the wireless standards of some areas that inhibit a plurality of wireless devices from

simultaneously operating in a personal computer which incorporates a plurality of wireless devices in a single housing.

WHAT IS CLAIMED IS:

1. An information device comprising:

a first wireless module which performs wireless communication in accordance with a first communication way;

a second wireless module which performs wireless communication in accordance with a second communication way;

means which selects either one of said first and second wireless modules; and

a control unit which, when said first wireless module is selected by said selection means, disenables wireless communication via said second wireless module and then enables said first wireless module, and when said second wireless module is selected, disenables wireless communication via said first wireless module and then enables said second wireless module.

2. A device according to claim 1, wherein the first communication way includes a communication way based on a Bluetooth standard, and the second communication way includes a communication way based on an IEEE 802.1b standard.

3. A device according to claim 1, wherein said first and second wireless modules are powered off when wireless communication via said first and second wireless modules is disenabled.

4. An information device comprising:

a Bluetooth wireless module which performs wireless communication in accordance with a Bluetooth standard;

a wireless LAN unit which performs wireless communication in accordance with an IEEE 802.1b standard;

a first utility which determines a selected wireless module on the basis of a user instruction, and when the selected wireless module is determined as said Bluetooth wireless module, instructs to power off said wireless LAN unit;

a second utility which instructs to turn on said Bluetooth wireless module on the basis of the instruction from said first utility that represents power off of said wireless LAN unit;

a BIOS which instructs to power off said wireless LAN unit on the basis of the instruction from said first utility, and instructs to power on said Bluetooth wireless module on the basis of the instruction from said second utility; and

a controller which controls to stop power supply to said wireless LAN unit on the basis of the instruction from said BIOS that represents power off of said wireless LAN unit, and which, upon receiving the instruction from said BIOS that represents power on of said Bluetooth wireless module, controls to supply power to said Bluetooth wireless module after said

wireless LAN unit is powered off.

5. A device according to claim 4, further comprising means for loading a control driver of said Bluetooth wireless module to an operating system when said Bluetooth wireless module receives power.

6. A device according to claim 4, wherein

when the selected wireless module is determined as said wireless LAN unit, said first utility notifies said second utility that said wireless LAN has been selected,

said second utility instructs said BIOS to power off said Bluetooth wireless module on the basis of the notification from said first utility that said wireless LAN has been selected,

said BIOS instructs said controller to power off said Bluetooth wireless module on the basis of the instruction from said second utility that represents power off of said Bluetooth wireless module, and

said controller powers off said Bluetooth wireless module on the basis of the instruction from said BIOS that represents power off of said Bluetooth wireless module.

7. A device according to claim 6, further comprising means for unloading a driver of said Bluetooth wireless module when said Bluetooth wireless module is powered off.

8. A device according to claim 7, wherein

when the driver of said Bluetooth wireless module is unloaded, said first utility instructs said BIOS to power on said wireless LAN unit,

said BIOS instructs said controller to power on said wireless LAN unit on the basis of the instruction from said first utility that represents power on of said wireless LAN unit, and

said controller controls to supply power to the RF controller of said wireless LAN unit on the basis of the instruction from said BIOS that represents power on of said wireless LAN unit.

9. A device according to claim 4, wherein said controller includes a one-chip microcomputer.

10. A device according to claim 4, wherein said first and second wireless modules use a wireless frequency band in which said first and second wireless modules interfere with each other.

11. A wireless module switching method in an information device having a first wireless module which performs wireless communication in accordance with a first communication way, and a second wireless module which performs wireless communication in accordance with a second communication way, comprising:

determining based on a user instruction whether a selected wireless module is the first wireless module; and

when the selected wireless module is determined as

the first wireless module, enabling the first wireless module and disenabling the second wireless module, and when the selected wireless module is not determined as the first wireless module, disenabling the first wireless module and enabling the second wireless module.

12. An information device comprising:

a first wireless module which performs wireless communication in accordance with a first communication way;

a second wireless module which performs wireless communication in accordance with a second communication way;

means which can select either one of said first and second wireless modules;

a BIOS which, when said first wireless module is selected by said selection means, instructs to stop power supply to said second wireless module and then instructs to supply power to said first wireless module, and when said second wireless module is selected by said selection means, instructs to stop power supply to said first wireless module and then instructs to supply power to said second wireless module; and

a controller which powers off either one of said first and second wireless modules and then powers on the other one of said first and second wireless modules

on the basis of an instruction from said BIOS.

13. A wireless module switching method in an information device having a first wireless module which performs wireless communication in accordance with a first communication way, and a second wireless module which performs wireless communication in accordance with a second communication way, comprising:

determining which of the first and second wireless modules has been selected, and notifying a BIOS of the information device of a determination result from selection means;

causing the BIOS to instruct to stop power supply to the second wireless module and then instruct to supply power to the first wireless module in accordance with a notification that the first wireless module has been selected, and to instruct to stop power supply to the first wireless module and instruct to supply power to the second wireless module in accordance with a notification that the second wireless module has been selected; and

powering on/off the first and second wireless modules on the basis of the instruction from the BIOS.

ABSTRACT OF THE DISCLOSURE

This invention provides an information device which disenables unselected wireless devices by directly controlling hardware, and thus can prevent interference between wireless devices using the same frequency band. In this invention, a BIOS controls an EC for a wireless module selected based on a user instruction, thereby controlling power supply to a Bluetooth module and power supply to a wireless LAN module. This makes it possible to enable either one of the modules and disenable the other module.

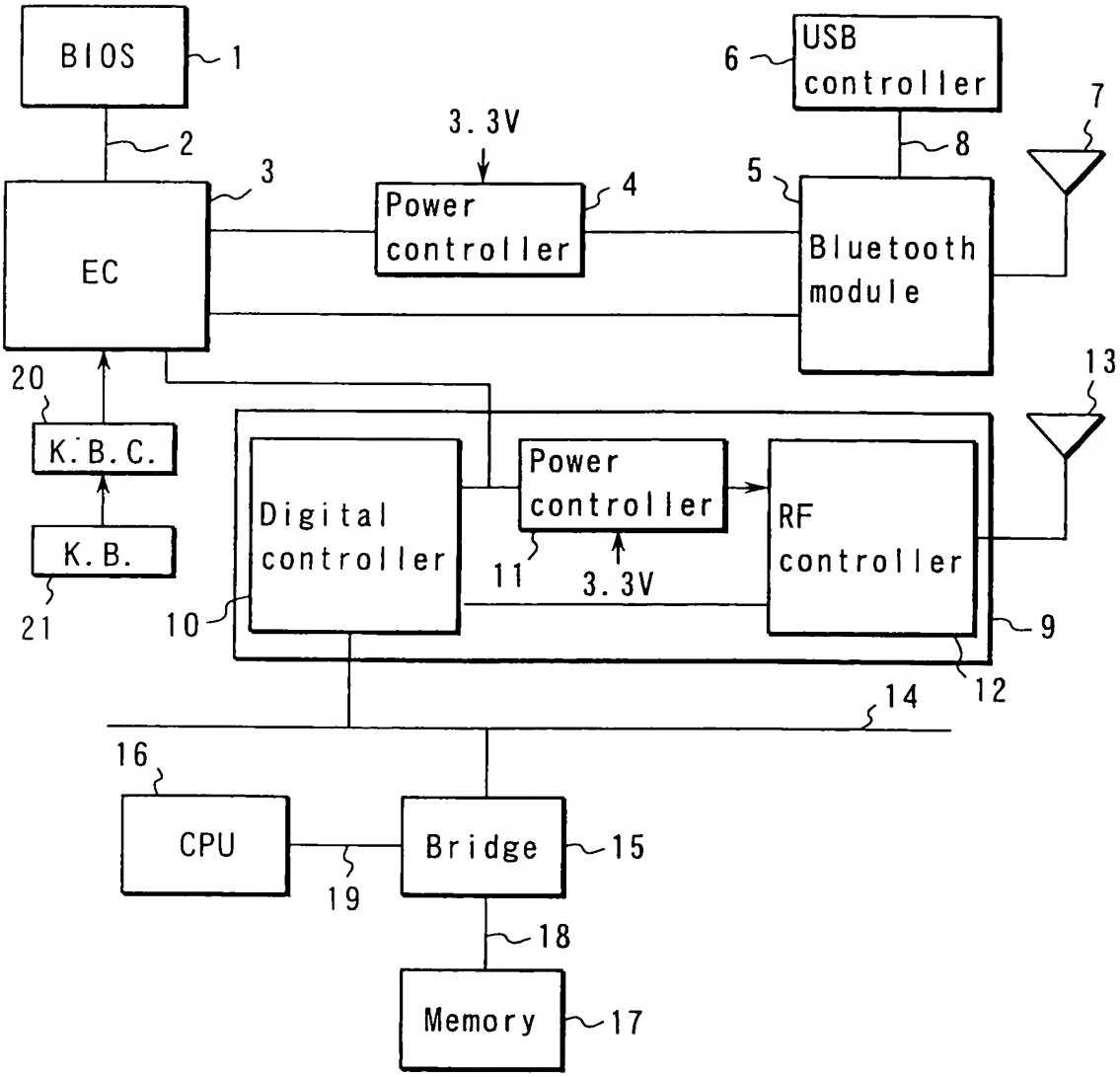
BIOS
1
2
3
EC
3.3V
Power controller
4
6
USB controller
7
8
5
Bluetooth module
20
K.B.C.
K.B.
21
13
Digital controller
10
Power controller
11
3.3V
RF controller
9
12
14
16
CPU
19
Bridge
15
18
Memory
17

FIG. 1

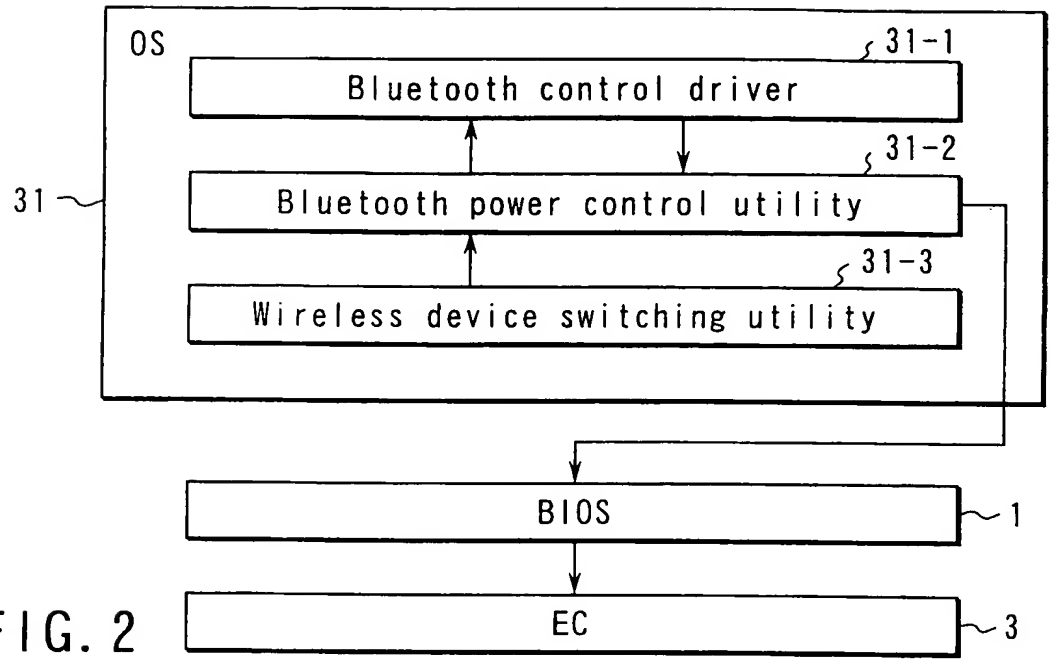
OS
31-1
Bluetooth control driver
31-2
31
Bluetooth power control utility
31-3
Wireless device switching utility
BIOS
1
EC
3

FIG. 2

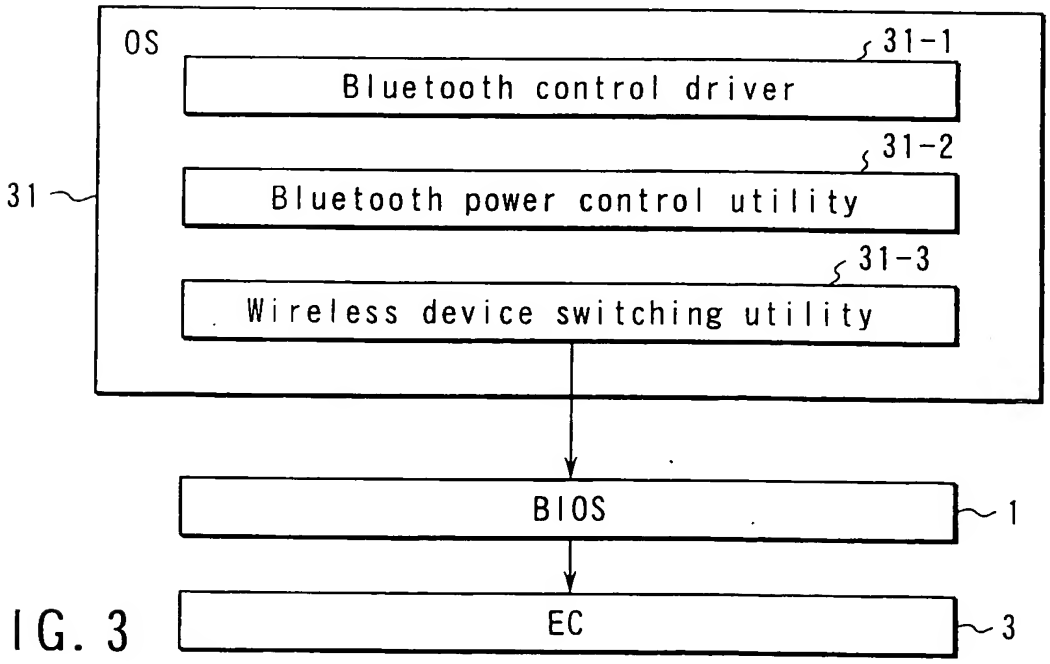
OS
31-1
Bluetooth control driver
31-2
31
Bluetooth power control utility
31-3
Wireless device switching utility
BIOS
1
EC
3

FIG. 3

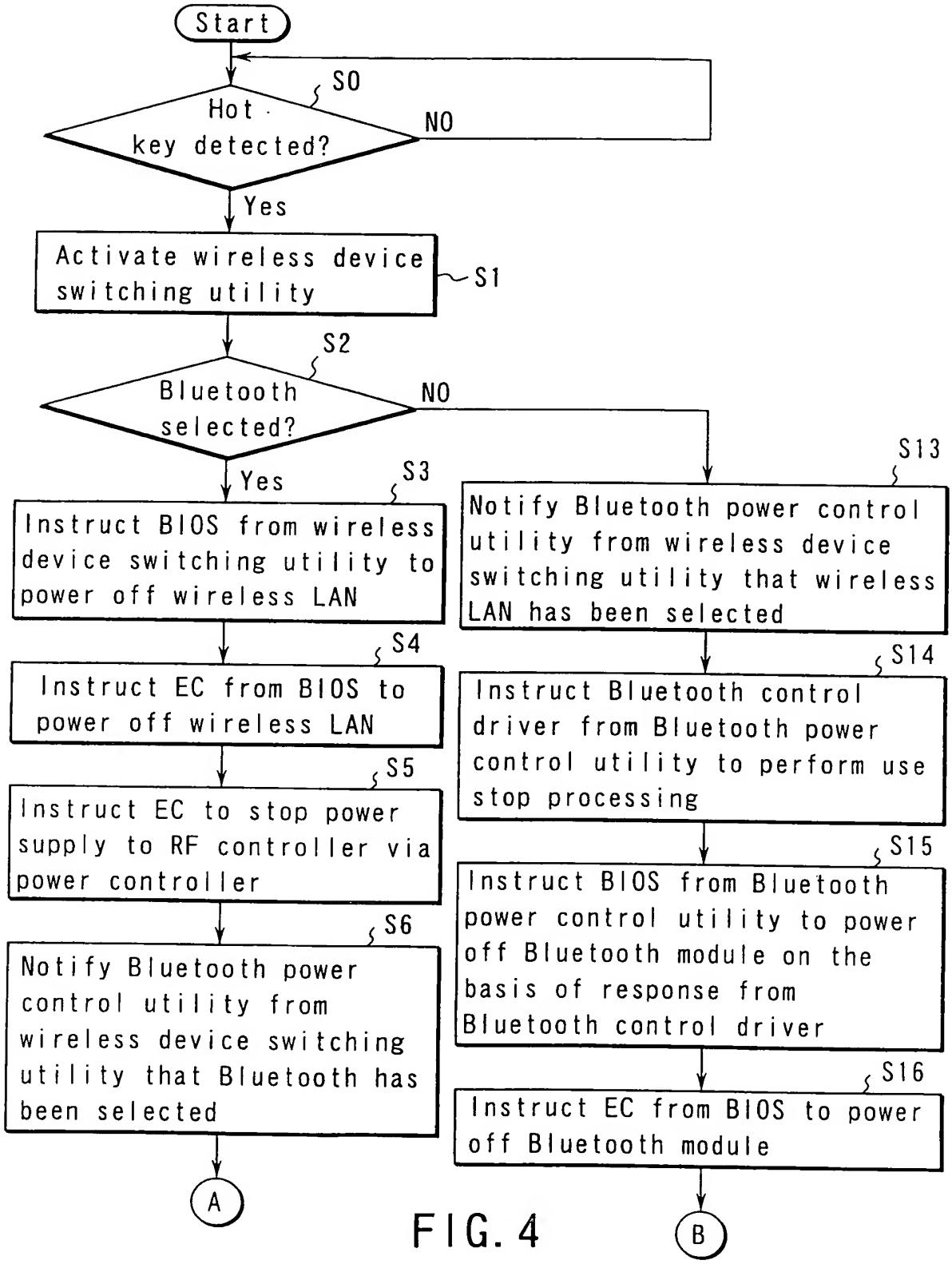
Start
S0
Hot key detected?
NO
Yes
Activate wireless device switching utility
S1
S2
Bluetooth selected?
NO
Yes
S3
Instruct BIOS from wireless device switching utility to power off wireless LAN
S4
Instruct EC from BIOS to power off wireless LAN
S5
Instruct EC to stop power supply to RF controller via power controller
S6
Notify Bluetooth power control utility from wireless device switching utility that Bluetooth has been selected
A
S13
Notify Bluetooth power control utility from wireless device switching utility that wireless LAN has been selected
S14
Instruct Bluetooth control driver from Bluetooth power control utility to perform use stop processing
S15
Instruct BIOS from Bluetooth power control utility to power off Bluetooth module on the basis of response from Bluetooth control driver
S16
Instruct EC from BIOS to power off Bluetooth module
B

FIG. 4

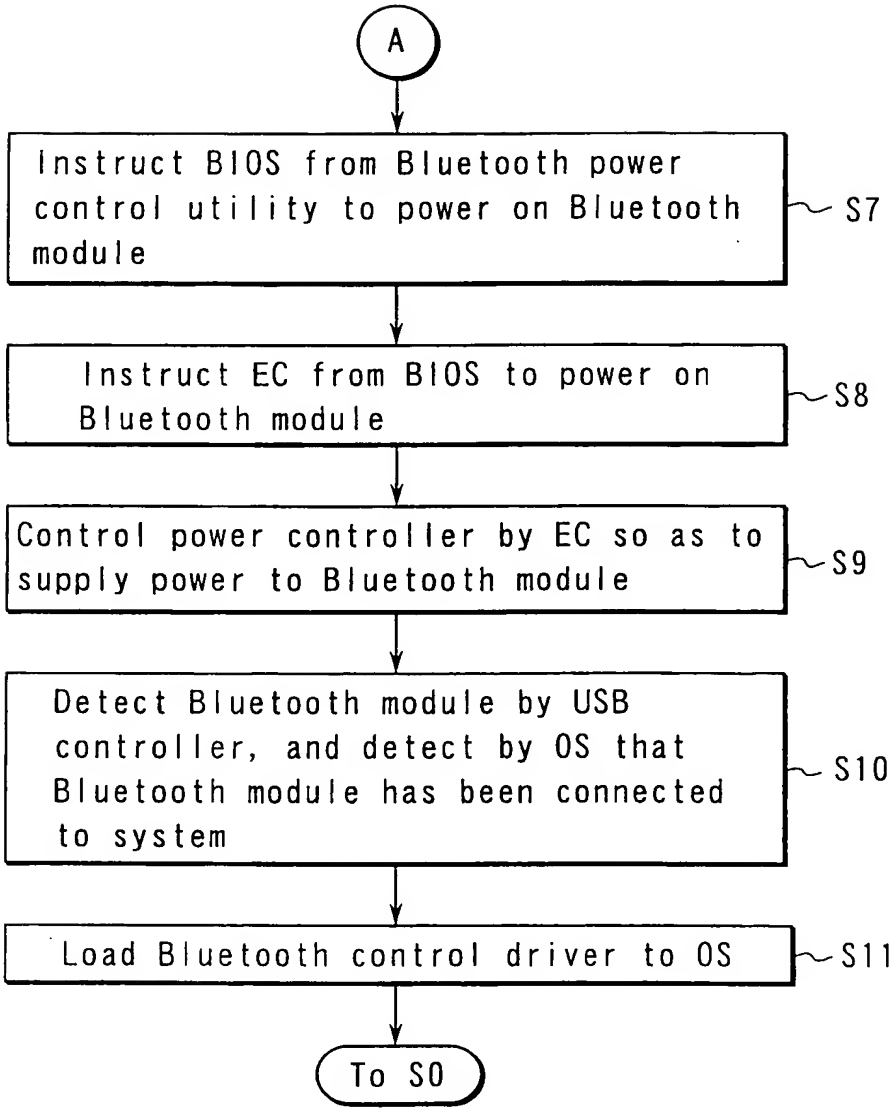
A
Instruct BIOS from Bluetooth power control utility to power on Bluetooth module
S7
Instruct EC from BIOS to power on Bluetooth module
S8
Control power controller by EC so as to supply power to Bluetooth module
S9
Detect Bluetooth module by USB controller, and detect by OS that Bluetooth module has been connected to system
S10
Load Bluetooth control driver to OS
S11
To S0

FIG. 5

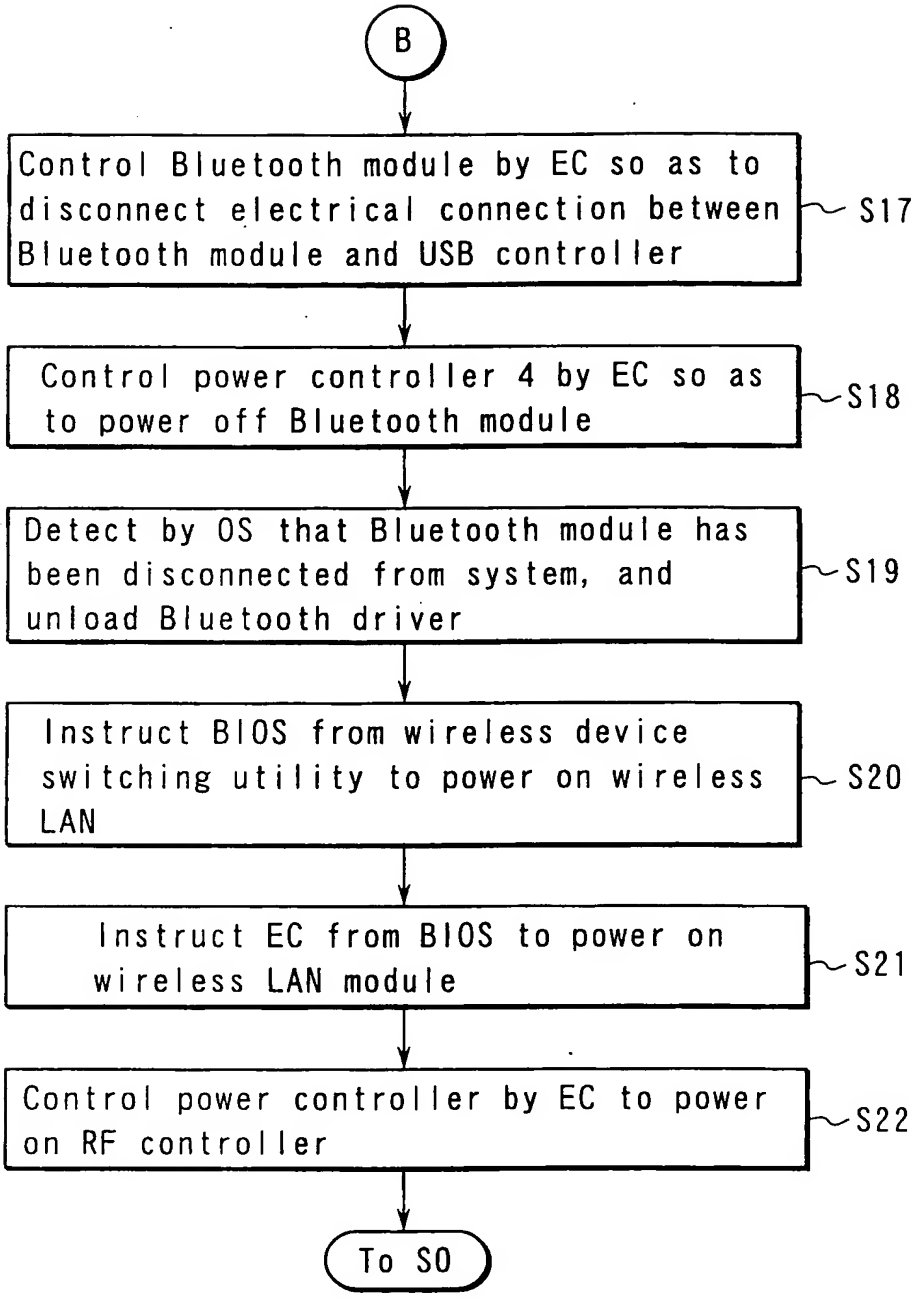
B
Control Bluetooth module by EC so as to disconnect electrical connection between Bluetooth module and USB controller
S17
Control power controller 4 by EC so as to power off Bluetooth module
S18
Detect by OS that Bluetooth module has been disconnected from system, and unload Bluetooth driver
S19
Instruct BIOS from wireless device switching utility to power on wireless LAN
S20
Instruct EC from BIOS to power on wireless LAN module
S21
Control power controller by EC to power on RF controller
S22
To S0

FIG. 6

4329.2697

RV3/USO

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09/987,615	11/15/2001	2661	870	04329.2697	4	9	3

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UPDATED FILING RECEIPT

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Finnegan, Henderson, Farabow
Garrett & Dunner, L.L.P.
1300 I Street, N.W.
Washington, DC 20005-3315

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FEB 11 2002

FINNEGAN, HENDERSON,
FARABOW, GARRETT & DUNNER, LLP

Date Mailed: 02/06/2002

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Applicant(s)

Takeshi Tajima, Ome-shi, JAPAN;
Kazuo Fukaya, Ome-shi, JAPAN;

Domestic Priority data as claimed by applicant

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JAPAN 2000-351608 11/17/2000

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Projected Publication Date: 05/23/2002

Non-Publication Request: No

Early Publication Request: No

Title

Switch control system and switch control method for communication apparatus

Preliminary Class

370

gdh

FEB 1 1 2002

DMS 2.11.02 3

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Title 37, Code of Federal Regulations, 5.11 & 5.15

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TITLE OF THE INVENTION

SWITCH CONTROL SYSTEM AND SWITCH CONTROL METHOD FOR COMMUNICATION APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is based upon and claims the benefit of priority from the prior Japanese Patent Application No. 2000-351608, filed November 17, 2000, the entire contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a control system and a control method for statically or dynamically switching and controlling a communication device included in a personal computer or the like.

2. Description of the Related Art

Normally, an electronic device such as a personal computer (hereinafter called a "PC") or the like can be connected with various communication devices. Those various communication devices are included in or externally attached to a PC or the like, and are statically or dynamically managed by control functions of the operating system (hereinafter called "OS") of the PC or the like.

There is a case that a user makes data communication in an environment in which a plurality of communication devices are thus connected with a PC. In

this case, which communication device is used to make the communication is determined by a routing table included in the PC or the like. Therefore, if the user desires to use a communication device different from the communication device determined by the routing table, the contents of the routing table need to be changed and updated.

However, management of the routing table is very difficult and complicated in general. If an ordinary user changes and updates the contents of the routing table to carry out switching and control of communication devices, operationality and rapidness are lost unsuitably for practical use.

In addition, a conventional PC or the like is not provided with a hardware or software function to switch communication devices in correspondence with the situation.

The present invention has been made in view of the above situation and has an object of providing a system and a method for switching communication devices, which are capable of easily executing switching between electronic devices at low costs and hence improving the handling of a computer or the like, without asking a user to make difficult or complicated state of communication devices.

BRIEF SUMMARY OF THE INVENTION

According to the first aspect of the present

invention, there is provided a communication device switching control system comprising: a plurality of communication devices; a memory configured to store operational state information concerning each of the plurality of communication devices; a selection device configured to select a desired one of the plurality of communication devices; a state information administrative device configured to set up usable with respect to operational information of the selected communication device, and to store the setting operational state information to the memory; and

a controller configured to control the selected communication device, in accordance with the setting operational state information stored in the memory.

According to the second aspect of the present invention, there is provided a communication device switching control method comprising steps of: selecting a desired one of a plurality of communication devices; setting up usable with respect to operational information of the selected communication device; storing the setting operational information to a memory; and controlling each of the communication devices in accordance with the setting operational information in the memory.

According to the third aspect of the present invention, there is provided a communication device switching control system comprising: a plurality of

communication devices; a memory configured to store state information concerning each of the plurality of communication devices; a first computer code device configured to select a desired one of the plurality of communication devices; a second computer code device configured to set up usable with respect to operational information of the selected communication device, and to store the setting operational state information to the memory; and controller for controlling each of the communication devices, in accordance with the setting operational state information stored in the memory.

Functions and structures of electronic devices in recent years are very complicated. If switching between these electronic devices is realized by connection switching based on hardware, it costs very much and is therefore not suitable for practical use.

If the switching between electronic devices is realized by software, a user is forced to make very complicated operation. In particular, operation of switching from a static state to a dynamic state requires a very high technique.

In contrast, the communication device switching control system or method having the structure as described above is constructed in a structure in which a standard function provided by a very simple interface and OS is utilized to carry out switching between electronic devices.

Thus, according to the present communication device switching control system or method, a user can execute easily switching between electronic devices at low costs without making difficult and complicated state of communication devices. As a result, the handling ability of the computer or the like can be improved.

Additional objects and advantages of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The objects and advantages of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed out hereinafter.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate embodiments of the invention, and together with the general description given above and the detailed description of the embodiments given below, serve to explain the principles of the invention.

FIG. 1 is a block diagram of a computer system comprising a communication device switching control system according to the embodiment;

FIG. 2 is a block diagram showing the communication device switching control system;

FIG. 3 is a flowchart showing a procedure of a

communication device switching operation which is executed by the communication device switching control system;

FIG. 4 is a view showing an example of selecting a communication device with the use of the GUI (Graphical User Interface);

FIG. 5 is an explanatory view of a communication device switching operation which is executed by the communication device switching control system; and

FIG. 6 is an explanatory view of a communication device switching operation which is executed by the communication device switching control system.

DETAILED DESCRIPTION OF THE INVENTION

An embodiment of the present invention will be explained with reference to the drawings. The following explanation deals with an example of a communication device switching control system constructed in a computer system comprised of a personal computer (hereinafter called a "PC") or the like and a communication-device connected with the PC. However, the communication device switching control system according to the present invention is not limited to the present invention but is applicable to a system comprised of a network appliance or an electronic device such as a portable phone or the like and a plurality of communication devices.

In the following explanation, those components

that have a substantially similar function and a substantially similar structure will be denoted by the same reference symbols, and an explanation thereof will be repeated only if necessary.

FIG. 1 is a block diagram showing a computer system comprising a communication-device switching control system according to the present embodiment.

In FIG. 1, a computer system 1 includes a CPU module 20, a PCI bus 22, an ISA bus 24, a main memory 26, a DVD decoder 28, an I/O controller 30, a PCI interface bridge 32, a hard disk drive HDD 33, a flash BIOS_ROM 34, a graphic controller 36, an EC/KBC 38, an LCD 42, and communication devices A, B, C, and D connected through ports 50 to a predetermined bus.

The CPU module 20 executes operation control and data processing of the entire computer system. A controller or the like for controlling the CPU, cash, and main memory 26 is mounted on the module 20.

The CPU module 20 executes operation control and data processing of a communication device switching control system which will be described later.

The main memory 26 functions as a main storage device of the present computer system. The main memory 26 stores an operating system, an application program as a processing target, and data and the like prepared on the basis of the application program.

An operation system (hereinafter called "OS")

Windows 95 (registered trademark) manufactured by Microsoft is developed on the main memory 26. The communication device switching control system 10 is constructed among a plug-and-play section 11 started by the OS, a registry 12, a communication device switching module 13 (described later), and communication devices A to D.

The I/O controller 30 is a gate array for controlling various I/O devices included in the body of the computer 1, and performs control concerning input/output of devices connected to various I/O connectors such as USB ports and the like.

The PCI interface bridge (PCI I/F) 32 is a gate array realized by a one-chip LSI. This PCI I/F 32 has a bridge function to connect the PCI bus 22 and the ISA bus 24 with each other and a function to control the HDD 68.

The flash BIOS_ROM 34 is a program-rewritable flash memory and stores a system BIOS. Note that the system BIOS systemizes a function execution routine for accessing various hardware in the present computer system.

The graphic controller 36 is an LSI having a drawing function which supports VGA (Video Graphics Array) (640 dots × 480 lines), SVGA (800 dots × 600 lines), XGA (1024 dots × 768 lines), and the like.

The LCD 42 is a display device which displays

images on the basis of control signals and image data from the graphic controller 36.

EC/KBC 38 is a characteristic part of the present invention, and it converts input signals from the keyboard 40 and a mouse 41 into bit strings, and transfers them to respective control sections.

Each of the communication devices A, B, C, and D is any of communication devices of a wireless LAN communication device, a wired LAN communication device, a Bluetooth device, a telephone line modem, a portable phone, and the like, and is connected with the PC body.

In the present embodiment, four communication devices are mounted or connected as described above. Needless to say, however, the communication device switching control system is effectively used for any electronic device such as a PC or the like, which mounts or connects two or more communication devices.

Next, the communication device switching control system 10 developed on the present computer system 1 will be explained with reference to FIG. 2.

FIG. 2 is a block diagram showing the communication device switching control system 10. The present communication device switching control system is constructed by a plug-and-play section 11, a registry 12, and a switching module 13.

(Plug-and-play section)

The plug-and-play section 11 has a function to

perform automatical incorporation and state of a device driver, i.e., plug-and-play when an expansion card, a peripheral device, or the like is connected to the PC. The plug-and-play section 11 checks the respective communication devices described above or other peripheral devices, which are connected at the time when the OS is started, and assigns I/O (input/output) addresses and IRQ (interruption signals) to them. Simultaneously, the section 11 simultaneously reads corresponding device driers, thus dynamically managing the hardware structure.

In addition, the plug-and-play section 11 can add/delete hardware by the plug-and-play function without stopping the function of the OS. The function of adding/deleting hardware to switch communication devices is one of features of the present communication device switching control system.

Further, the plug-and-play section 11 automatically executes restarting or the like of the computer if necessary in case where no device driver for a connected device exists in the library of the OS.

In general, the plug-and-play function is provided for a device using a USB bus, a device according to IEEE 1394 standard, a device using a PCI bus, and the like, in many cases, and is also a standard function included in an OS.

(Registry)

The registry 12 is a place for storing information concerning specification and environmental states of drivers for various devices such as communication devices and the like, and concerns their relationship with applications. When various properties and states are changed, information thereof is stored in the registry 12.

For example, if state information of the plug-and-play stored in the registry 12 is changed, the plug-and-play section 11 or the OS operates in accordance with the state after the change. Normally, management of the environmental states based on the information in the registry 12 is carried out by a routing table.

(Switching Module)

The switching module 13 is a mechanism for changing the states in the registry 12, based on a predetermined input instruction, and is a feature of the present invention. For example, the switching module disconnects all the connected communication devices or renders only a selected communication device operational. This module thus has a function to change the state concerning various communication devices in the registry 12.

Next, the operation of the communication device switching control system constructed as described above will be explained with reference to FIG. 3. In the

computer system 1, a "standard state" is defined as a state in which control of communication devices is carried out by a conventional method without operating the present communication device switching control system 10. Also, in the computer system 1, a "basic state" is defined as a state in which only one selected communication device is rendered operational.

FIG. 3 is a flowchart showing a procedure of switching from the standard state to the basic state, executed by the communication device switching control system.

In FIG. 3, at first, exclusive use of only the communication device A is inputted by a predetermined operation through a mouse, keyboard, or the like (Step S1).

FIG. 4 is a view showing an example of selecting a communication device by using the GUI (Graphical Use Interface).

As shown in FIG. 4, for example, a user can select a desired communication device using the mouse. When a cursor is set on a "switch" icon displayed on the LCD 42, connected communication devices are displayed in the form of a pull-up or pull-down menu. The user selects (clicks) a desired communication device on the menu, thereby to check the communication device to be used. The menu closes and the selection operation is thus completed.

The menu shown in FIG. 4 has a structure in which all communication devices whose states are written in the registry 12 are displayed.

Also, it should preferably be arranged such that the communication device selected in step S1 is expressed as an icon displayed in a task tray on the LCD 42. In this case, the structure may be arranged such that the display form of the icon is changed when the selected communication device is operating.

Next, the switching module 13 changes the states of the communication devices in the registry 12 in response to the operation of the communication device selecting operation (step S2). Namely, the switching module 13 switches all usable states with respect to the communication devices in the registry 12 to stopped states.

Next, the switching module 13 transfers the new status in the registry 12 to the plug-and-play section 11. The plug-and-play section 11 stops related functions (e.g., TCP/IP or the like) provided by each communication device (step S3).

In addition, in accordance with the stop of the related functions, the routing table is initialized. This is the reason why the basic state might not reflect the communication information in the standard state.

FIG. 5 shows a state in which each of the

communication devices A to D is stopped by the function of the plug-and-play section 11. Oblique lines in the figure indicate that the communication devices are stopped. In addition, the message that each of the communication devices A to D is stopped is displayed on the LCD 42 under the stopping. The user can see that each of the communication devices A to D is temporarily stopped.

As shown in FIG. 5, after all the communication devices A to D are stopped, the switching module 13 switches the stopped state with respect to the communication device A selected in step 1 to the usable state (step S4). In addition, in accordance with the change of the state of the device A, the routing table manages the communication device A exclusively.

Note that, the procedures in step 2 and 3 may be omitted. In this case, though the routing table is not erased initialized, the communication device A can be used exclusively.

The plug-and-play section 11 starts only the communication device A, in response to the state of the communication device A being usable (step S5). At the same time the device A is started, the functions provided on the communication device A are started. That is, the plug-and-play section 11 automatically sets the communication function of the communication device A, thereby to enable the communication device A.

FIG. 6 shows a state in which only the communication device A is rendered usable by the function of the plug-and-play section 11. Oblique lines in this figure express that the communication devices are stopped.

As shown in FIG. 6, the present computer system 1 is in the basic state in which only the communication device A is usable. Therefore, a user can exclusively operate the communication device A.

As has been described above, in the switching control system according to the present embodiment, communication devices to be used are attached and detached by utilizing a standard function, i.e., the plug-and-play function provided by an OS. Therefore, it is necessary to detach communication devices to be used, and thus, unnecessary extra labor is not required for users.

Also, switching between communication devices is operated through a very simple interface. Hence, the user-friendlyness handling ability of computers or the like can be improved.

Thus, according to the present control system, users can carry out switching between electronic devices easily at low cost without making difficult and complicated states, so that the user-friendlyness of computers or the like can also be improved.

In addition, for example, a wireless LAN and

a Bluetooth device sometimes use close frequency bands, and may interfere with each other if both are used simultaneously. The present communication device switching control system is particularly useful when exclusively using any one of the communication devices in this kind of environment.

In the above description, the present invention has been explained on the basis of an embodiment. However, a person skilled in the art can think up various modifications and changes within the scope of the concept of the present invention. Such modifications and changes are considered to be also within the scope of the present invention. For example, various modifications are possible without changing the subject of the present invention.

The present communication device switching control system is constructed in a structure in which the communication functions of all communication devices are stopped in switching between communication devices. Therefore, in some cases, all inputs may be locked and users can not operate the OS. In this case, the structure may be arranged so as to display a message "Now Switching" while the devices are stopped. Alternatively, the structure may be arranged so as to make a report saying "Now Switching".

In this structure, users can easily understand that they can not operate the system. Users thus do

not feel stress from the temporary stop of the communication functions or the locked input.

Additional advantages and modifications will readily occur to those skilled in the art. Therefore, the invention in its broader aspects is not limited to the specific details and representative embodiments shown and described herein. Accordingly, various modifications may be made without departing from the spirit or scope of the general inventive concept as defined by the appended claims and their equivalents.

WHAT IS CLAIMED IS:

1. A communication device switching control system comprising:

a plurality of communication devices;

a memory configured to store operational state information concerning each of the plurality of communication devices;

a selection device configured to select a desired one of the plurality of communication devices;

a state information administrative device configured to set up usable with respect to operational information of said selected communication device, and to store the setting operational state information to said memory; and

a controller configured to control the selected communication device, in accordance with the setting operational state information stored in said memory.

2. The system according to claim 1, wherein said controller temporarily stops each of the plurality of communication devices and thereafter starts the communication device selected by said selection device, if the setting operational state information is stored to the memory.

3. The system according to claim 2, further comprising a notification device configured to notify a user that each of the communication devices is temporarily stopped while each of the communication

devices is temporarily stopped.

4. A communication device switching control method comprising steps of:

selecting a desired one of a plurality of communication devices;

setting up usable with respect to operational information of the selected communication device;

storing the setting operational information to a memory; and

controlling each of the communication devices in accordance with the setting operational information in said memory.

5. The method according to claim 4, wherein, after each of the communication devices is temporarily stopped in control of each of the communication devices in accordance with the setting operational information, only the selected communication device is started.

6. The method according to claim 5, wherein while each of the communication devices is temporarily stopped, a message that each of the communication devices is temporarily stopped is offered to a user.

7. A communication device switching control system comprising:

a plurality of communication devices;

a memory configured to store state information concerning each of the plurality of communication devices;

a first computer code device configured to select a desired one of the plurality of communication devices;

a second computer code device configured to set up usable with respect to operational information of said selected communication device, and to store the setting operational state information to said memory; and

controller for controlling each of the communication devices, in accordance with the setting operational state information stored in said memory.

8. The system according to claim 1, wherein said controller temporarily stops each of the communication devices and thereafter starts the communication device selected by said first computer code device, if the setting operational state information is stored to the memory.

9. The system according to claim 2, further comprising a third computer code device configured to notify a user that each of the communication devices is temporarily stopped while each of the communication devices is temporarily stopped.

ABSTRACT OF THE DISCLOSURE

A control system which is capable of selectively using any of a plurality of communication devices. When an operator selects a desired communication device from a plurality of communication devices, state information concerning each of the communication devices is rewritten so as to render only the selected communication device usable. The control system uses properties of the OS to temporarily stop all the communication devices, and thereafter controls only the selected communication device usable in accordance with the changed state information.

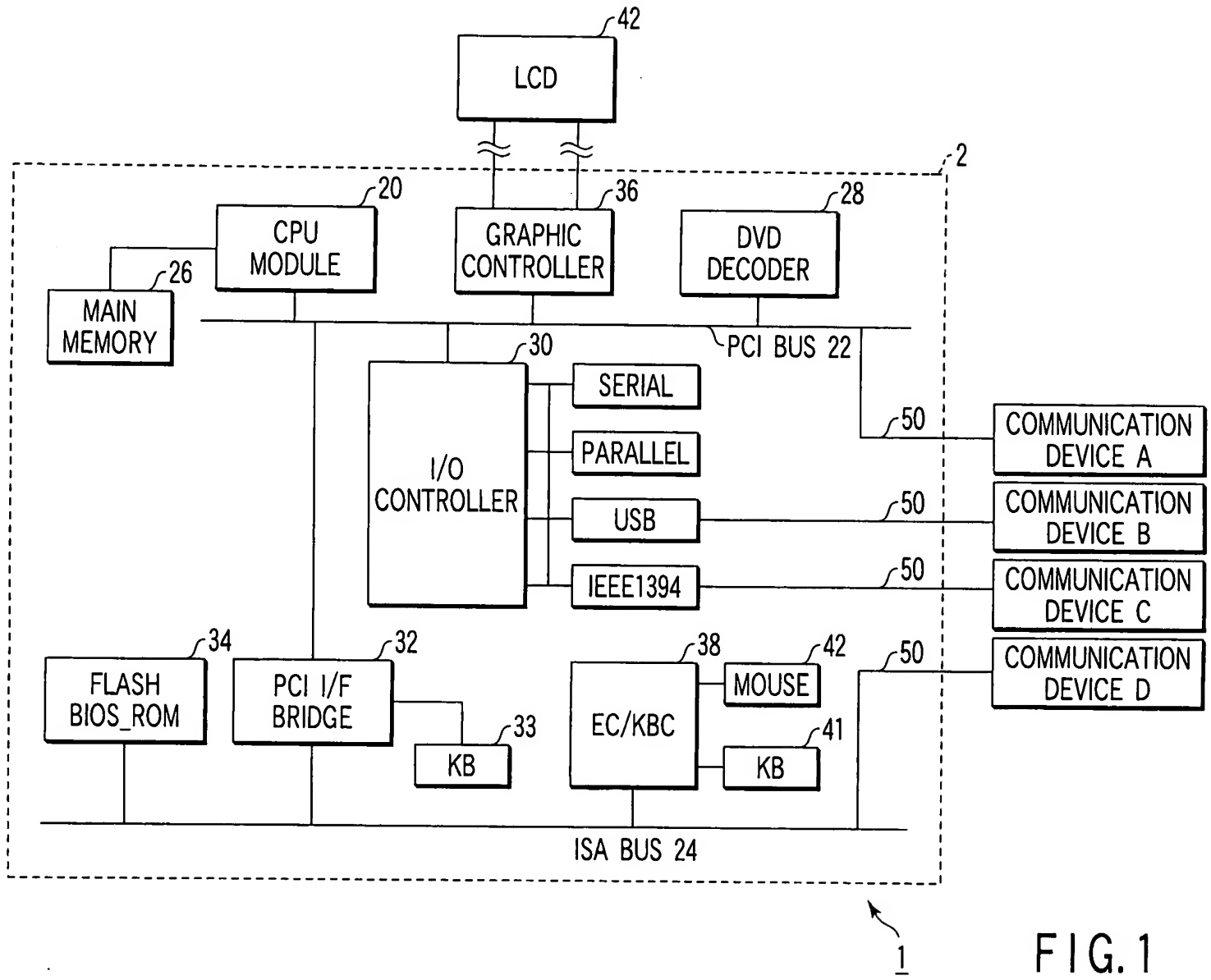
42
LCD
2
20
CPU MODULE
36
GRAPHIC CONTROLLER
28
DVD DECODER
26
MAIN MEMORY
PCI BUS 22
30
I/O CONTROLLER
SERIAL
PARALLEL
USB
IEEE1394
50
COMMUNICATION DEVICE A
50
COMMUNICATION DEVICE B
50
COMMUNICATION DEVICE C
50
COMMUNICATION DEVICE D
34
FLASH BIOS_ROM
32
PCI I/F BRIDGE
33
KB
38
EC/KBC
42
MOUSE
41
KB
ISA BUS 24
1

FIG. 1

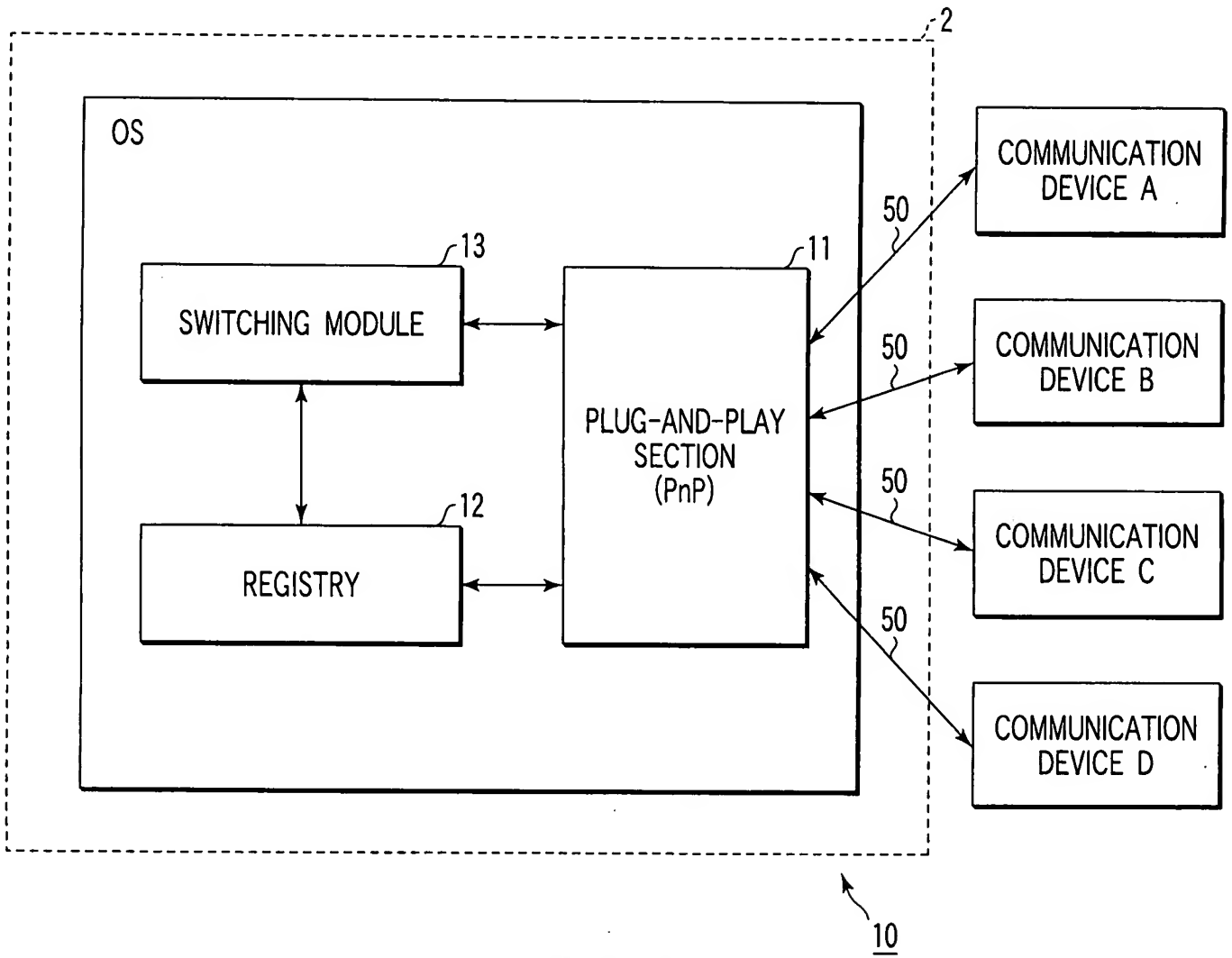
2
OS
13
SWITCHING MODULE
12
REGISTRY
11
PLUG-AND-PLAY
SECTION
(PnP)
50
50
50
50
COMMUNICATION
DEVICE A
COMMUNICATION
DEVICE B
COMMUNICATION
DEVICE C
COMMUNICATION
DEVICE D
10

FIG. 2

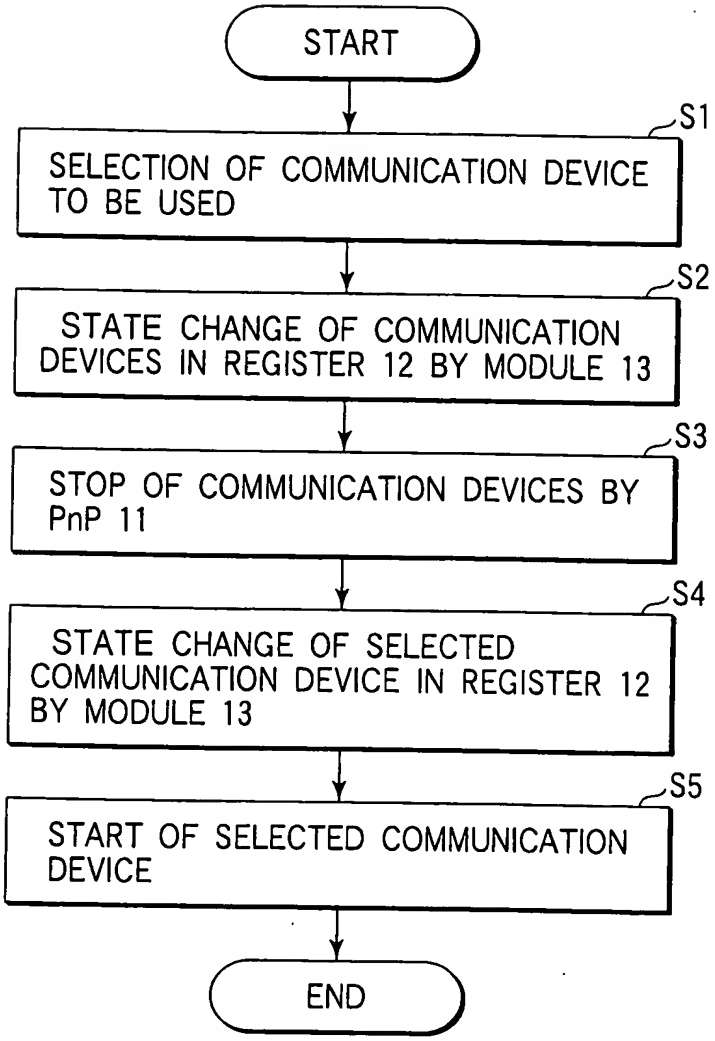
START
S1
SELECTION OF COMMUNICATION DEVICE TO BE USED
S2
STATE CHANGE OF COMMUNICATION DEVICES IN REGISTER 12 BY MODULE 13
S3
STOP OF COMMUNICATION DEVICES BY PnP 11
S4
STATE CHANGE OF SELECTED COMMUNICATION DEVICE IN REGISTER 12 BY MODULE 13
S5
START OF SELECTED COMMUNICATION DEVICE
END

FIG. 3

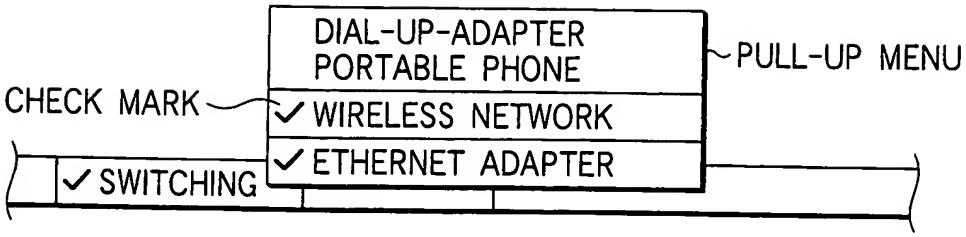

FIG. 4

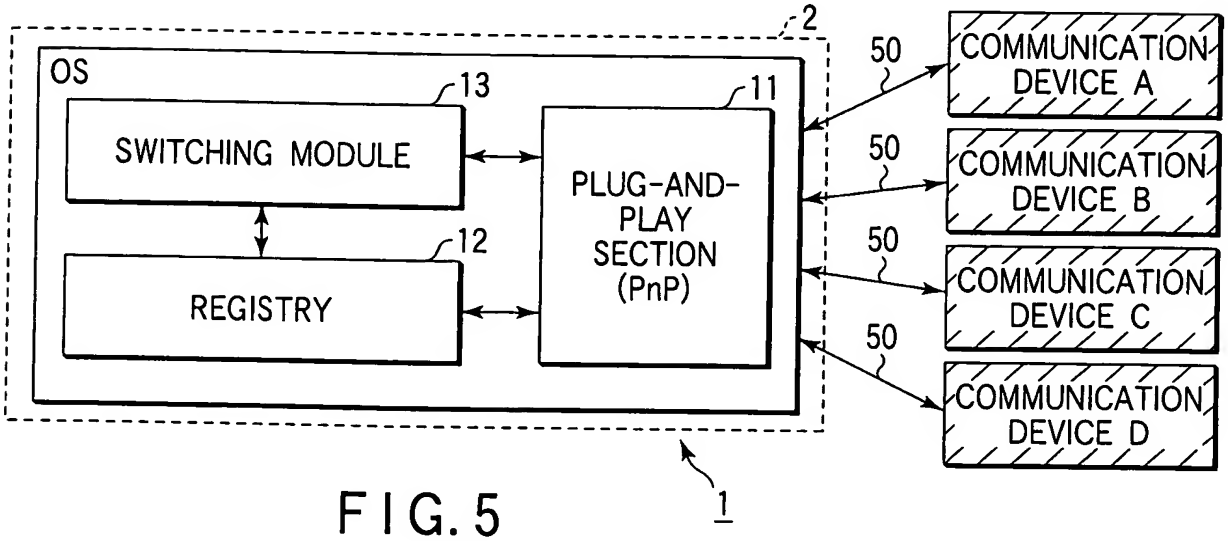

FIG. 5

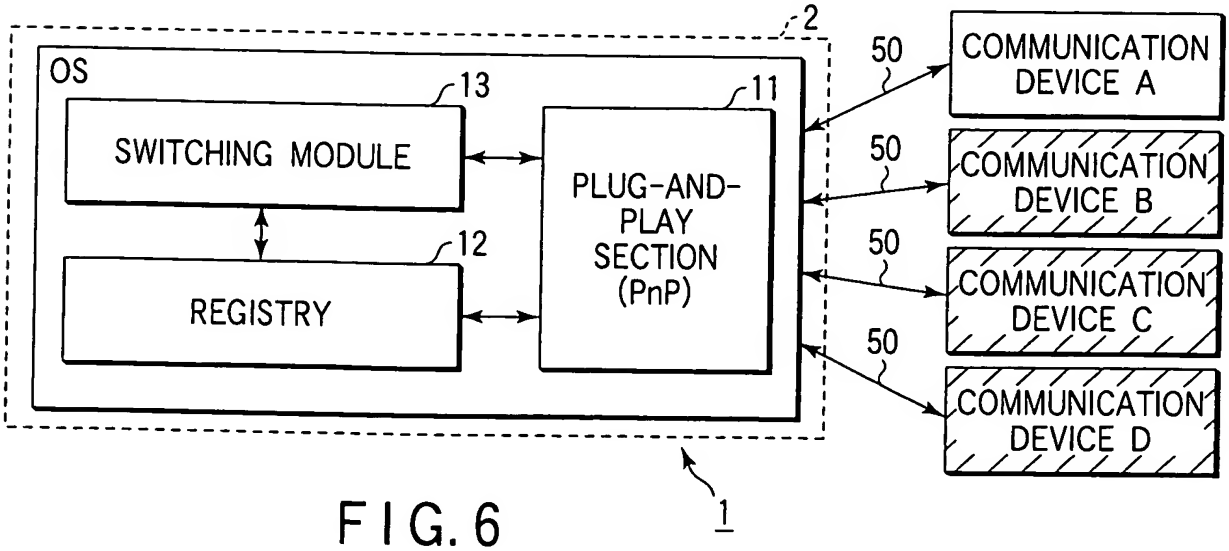

FIG. 6